National Future Extreme Heat Scenarios for Assessment of Climate Impacts on Public Health

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Objective: To provide historical and future measures of climate-driven heat events to enable assessments of heat impacts on public health over the coterminous U.S.

GCMs

We obtained GCM output of monthly mean minimum and maximum daily temperatures and monthly mean specific humidity.
Source: Coupled Model Intercomparison Project (CMIP3) Multi-Model Dataset Archive at Program for Climate Model Diagnosis and Intercomparison (PCMDI).
This activity was in support of the 4th Assessment Report (AR4).

Scenarios:
20th Century Climate for 1980 -1999
SRES A2 for 2030-2049 (2040) and 2080-2099 (2090)
SRES A1B for 2030-2049 (2040) and 2080-2099 (2090)

	Model	# Ensemble members used
1.	CCSM3 (NCAR)	2
2.	CSIRO-MK3.0 (Australia)	2
3.	CSIRO-MK3.5 (Australia)	3
4.	BCCR-BCM2.0 (Norway)	1
5.	INM CM3.0 (Russia)	1
6.	MIROC 3.2 Med. Res. (Japan)	3

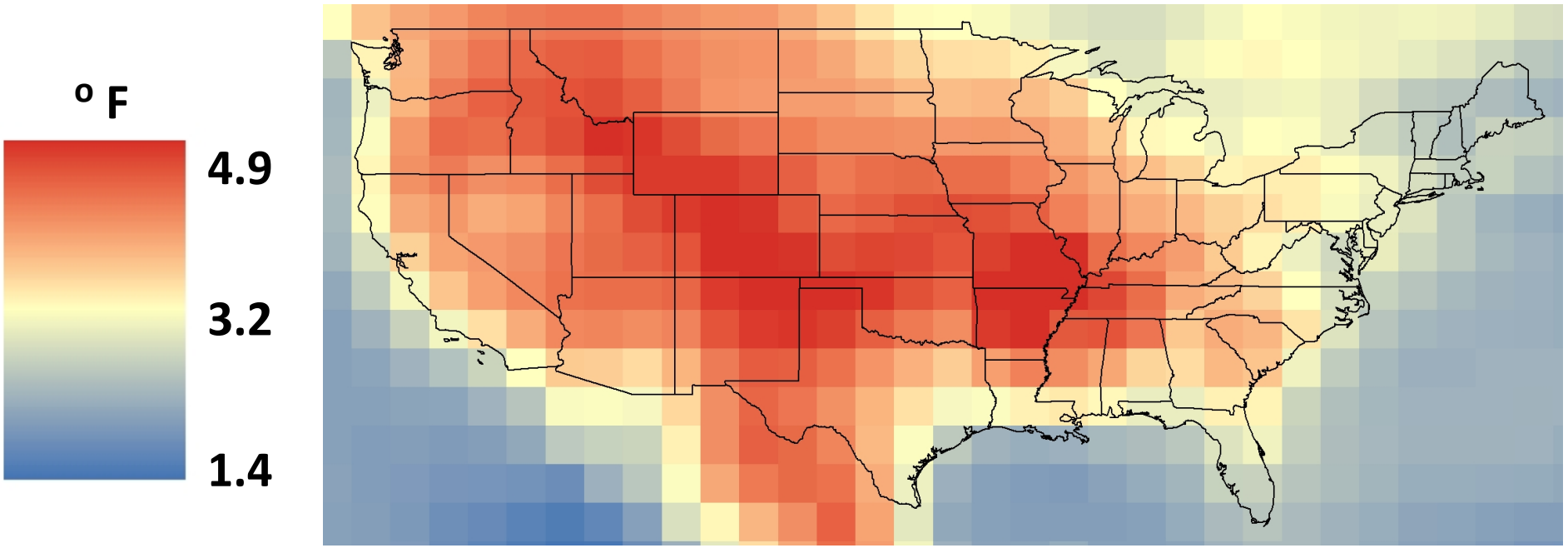
Means of each variable were computed across ensembles, then across models.

Key Results Expected

- GCM-scale monthly climatologies of max/min air temperature and specific humidity for the historical period 1981-2000, and future changes relative to this period.
- NLDAS-scale (~12 km) daily max/min temperatures, maximum heat index and Net Daily Heat Stress for historical period.
- NLDAS-scale statistics over 20-year past and future periods of heat stress measures.
- County-level heat stress measures to enable assessments of heat impacts on public health.

Mean Maximum Temperature Difference - August

2040 – 1990, Average of all models, all ensemble members, A2 scenario

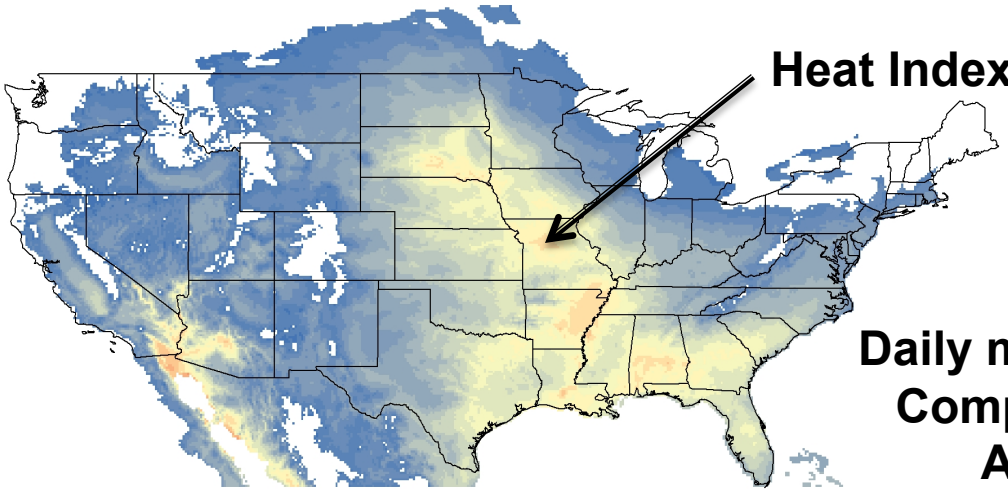


Example of current and future climates

Daily maximum Heat Index, A2 scenario

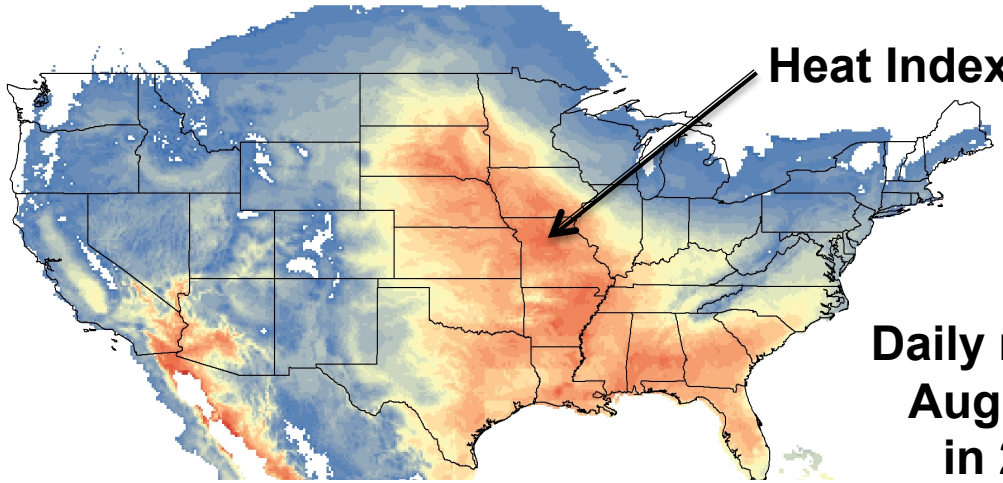
Heat Index (ºF)

- 78 - 80
- 80 - 84
- 84 - 88
- 88 - 92
- 92 - 96
- 96 - 100
- 100 - 102
- 102 - 104
- 104 - 106
- 106 - 108
- 108 - 110
- 110 - 112
- 112 - 114
- 114 - 116
- 116 - 118
- 118 - 120
- 120 - 122
- 122 - 124
- 124 - 126
- 126 - 128



Daily maximum Heat Index
Computed from NLDAS
August 13, 2007

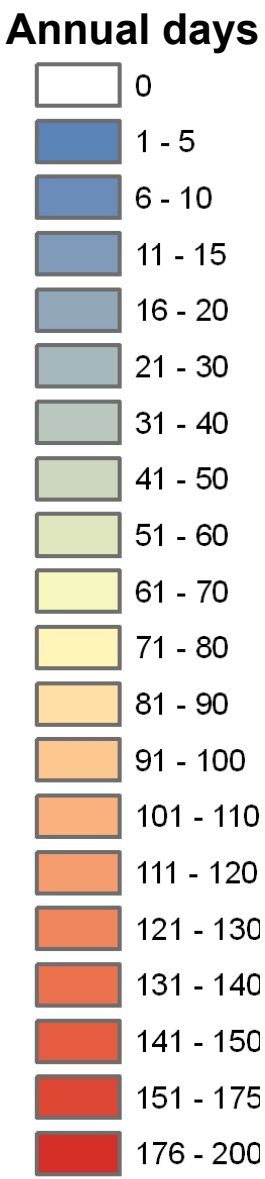
Add 2040-1990 D-climate (temperature & humidity) to obtain HI projections:

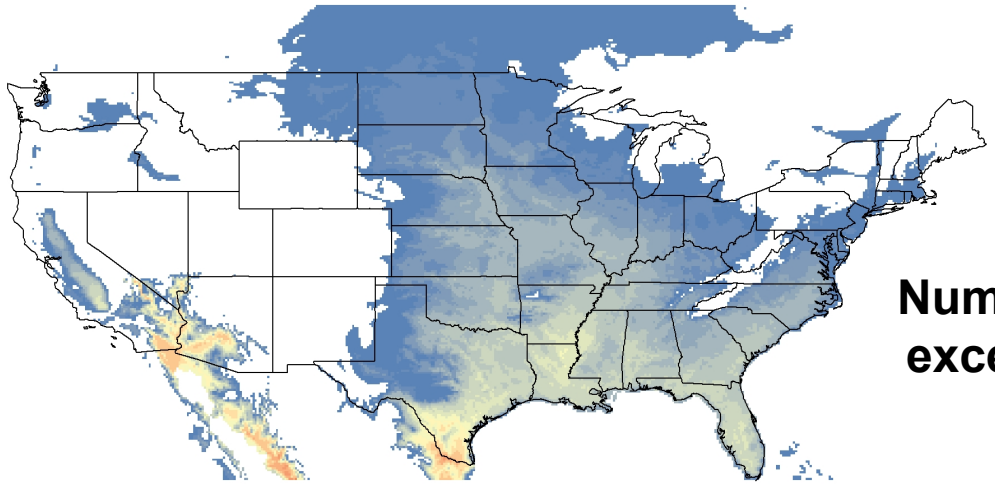


Daily maximum Heat Index
August 13, 2007 analog
in 2041-2060 climate

Example of current and future climates

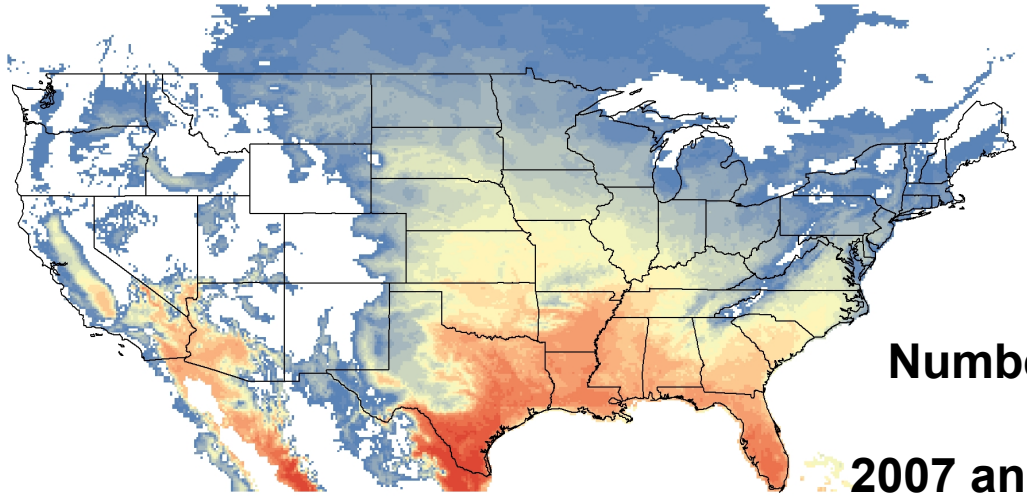
Number of annual days when Heat Index exceeds 100 ºF, A2 scenario





Number of days Heat Index exceeded 100 ºF based on 2007 NLDAS data

Add 2040-1990 D-climate (temperature & humidity) to obtain HI projections:



Number of days Heat Index to exceed 100 ºF 2007 analog in 2041-2060 climate

Task Schedule

Year 1 (September 2011 – 2012):

- Obtain NLDAS data for 1981-2000

- Completed

- Obtain GCM monthly mean inputs for 1981-2000 ('current'), 2031-2050 ('2040'), and 2081-2100 ('2090')

- Completed for current and both future climate scenarios, SRES A2 and SRES A1B

- Compute monthly differences, averaged over 20-year periods, between future and current climates (2040 and 2090)

- Completed for A2 climate scenario for 2040 and 2090
- In process for A1B scenario

Year 2 (September 2012 – 2013):

- Create hourly projections for 2040 & 2090 scenarios based on NLDAS + D climate
- Derive statistics of Heat Index, NDHS, Tmax and Tmin on daily basis for future climates; from these, derive annual statistics on NLDAS grid

- In process for A2 scenario; A1B scenario not yet begun

- Aggregate daily heat metrics to county scale

Year 3 (September - November 2013): Manuscripts/reports